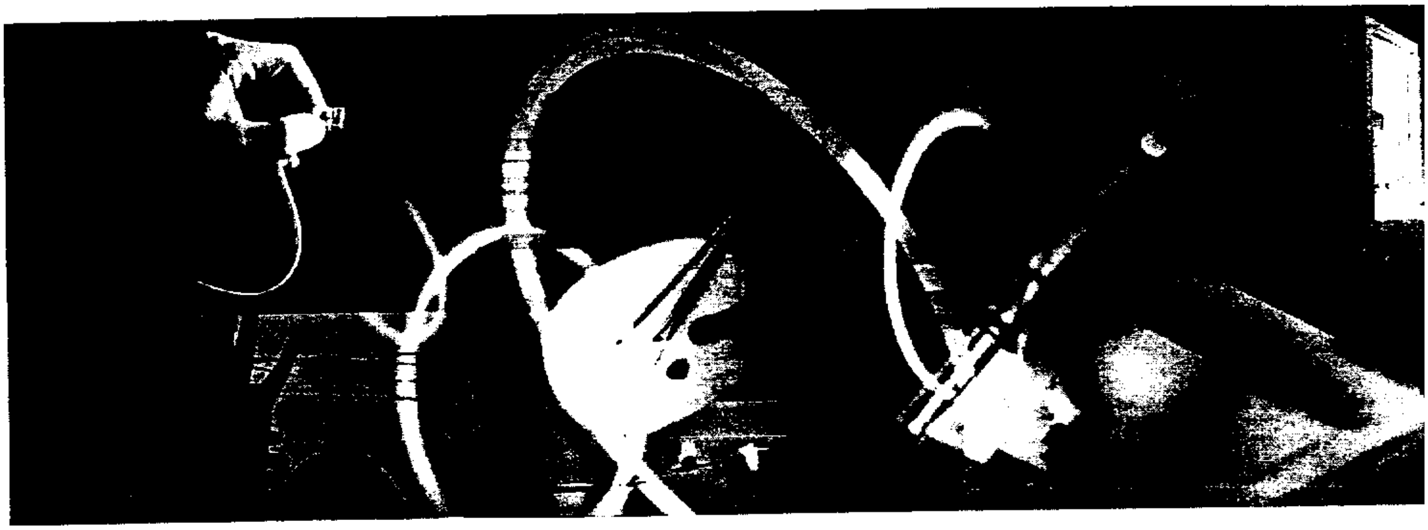
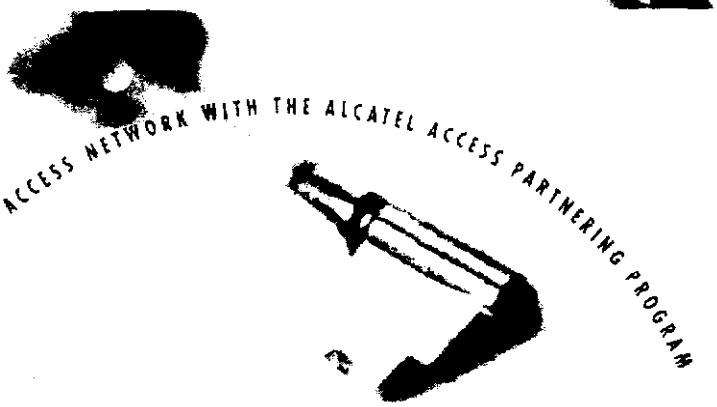
Alcatel Access
Partnering Program

The Broadband Television Solution



ALCATEL iMAGICTV nCUBE ORACLE



THE MISSION

Alcatel, iMagicTV, nCUBE, and Oracle, working through the Alcatel Access Partnering Program (AAPP), have joined together to create the most innovative interactive digital television services offered over today's networks.

Together, they have created a broadband television solution that allows telcos to leverage their current access networks and offer broadcast television and video on demand over ADSL.

OPEN THE DOOR TO REVENUE-GENERATING APPLICATIONS

The broadband TV solution allows service providers to offer a wide variety of revenue-producing services including these:

- Movies on demand
- Digital quality broadcast television
- Network VCR
- E-mail on TV
- TV on PC
- Education on demand
- Advertising insertion

The broadband TV solution is an end-to-end system for delivering video on demand and broadcast video over ADSL.

SOLUTION DESCRIPTION

The first time the set-top box is powered on, it sends out a request for registration. DTV Manager registers the user and downloads an image of the DTV Manager client, including the interactive program guide, through the set-top box. DTV Manager continues to update this image at regular intervals.

From the interactive program guide, users can access a multitude of program choices, including multicast video, TV programs, pay-per-view programs, video on demand, and Internet services. The user can select a program by scrolling up, down, forward, or back through several days of programming on the interactive program guide screen.

BROADCAST TV

If the broadcast TV (or pay-per-view) category is selected, the request is added to a multicast session on the multicast router/switch. This is done via Internet Group Management Protocol (IGMP) directly between the set-top box and the router.

VIDEO ON DEMAND

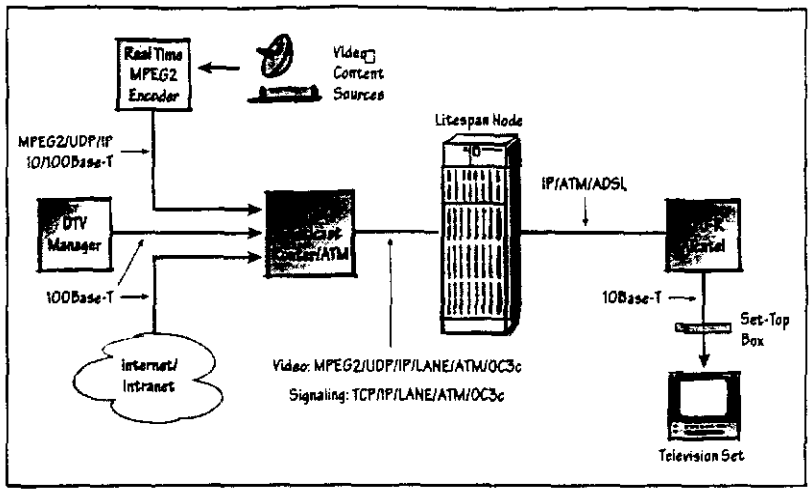
When the user chooses video on demand, the request is received by the DTV Manager server. The server informs the video server to start a particular stream and deliver it to a specific address using unicast. All VCR commands (play, forward, rewind) can be performed through the set-top box with the Real Time Stream Control Protocol (RTSP).

INTERNET

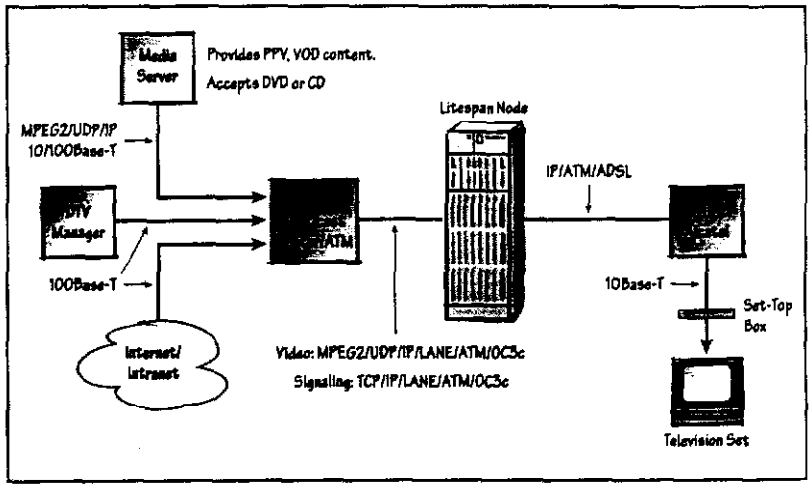
If the user selects the Internet choice, the remote control set can be used in lieu of a mouse or keyboard to navigate in the interactive program guide. The set-top box is connected to the Internet through the ADSL modem, Litespan node, and multicast router. The user can surf the web as desired.

OTHER

The user can also look at account information, including billing, via the interactive program guide.



Broadcast TV Over ADSL



Video on Demand Over ADSL

SOLUTION COMPONENTS

Multicast Router

Alcatel Xylan Multicast Router

Video Server

OVS—Oracle Video Server

Network Transport

Alcatel Litespan-2000 or Litespan-2012 system equipped with integrated ADSL

Media Server

nCUBE MediaCUBE

Operations System

iMagicTV DTV Manager

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OVERVIEW

When originally introduced in the industry, asymmetrical digital subscriber line (ADSL) technology was designed to provide broadcast video over twisted-pair copper cable. However, the rise of Internet applications and the bandwidth possibilities of ADSL shifted that focus. Today, service providers are rediscovering the revenue-generating possibilities of ADSL; applications, such as broadcast television and video-on-demand, along with advanced features like enhanced TV and interactive TV, can be provided using ADSL technology.

The key to developing new market opportunities and delivering high-speed, high-bandwidth applications is strategic partnerships with industry leaders in telecommunications, video, and standards-based software solutions. Service providers must adjust their data network architectures to support the broadcast-quality audio and video that consumers expect. Recognizing the specific demands of video in the telephony market, Alcatel, Oracle, nCUBE, and iMagicTV have combined their years of market-leading experience to develop a broadband television solution that fulfills the growing demands of today's subscribers.

This Alcatel Access Partnering Program (AAPP) end-to-end solution allows service providers to differentiate their portfolios from those of their competitors in the marketplace. The video-over-ADSL solution allows the data network currently in place to be adapted for new revenue streams. For example, networks with the market-leading Litespan® access platform from Alcatel will leverage investment with expanded broadband capabilities and the best-in-class products of Oracle, nCUBE, and iMagicTV. Each piece of the broadband TV solution is key to optimizing the embedded base for the best economic advantage. The following features and benefits are offered by the broadband TV solution:

- Scalability at every point in the broadband TV solution
- IP multicasting to improve service operation
- ADSL-based solution for revenue growth in networks with copper at their edge
- Key relationship between proven technologies
- Open standards for maximum interoperability and potential for growth
- Flexible solution components for customized branding, service definition, and pricing
- Best-in-class standards with robust, yet cost-effective performance

STRATEGIC SOLUTION OPERATION

Broadcast over ADSL

Figure 1 illustrates the AAPP broadband television solution.

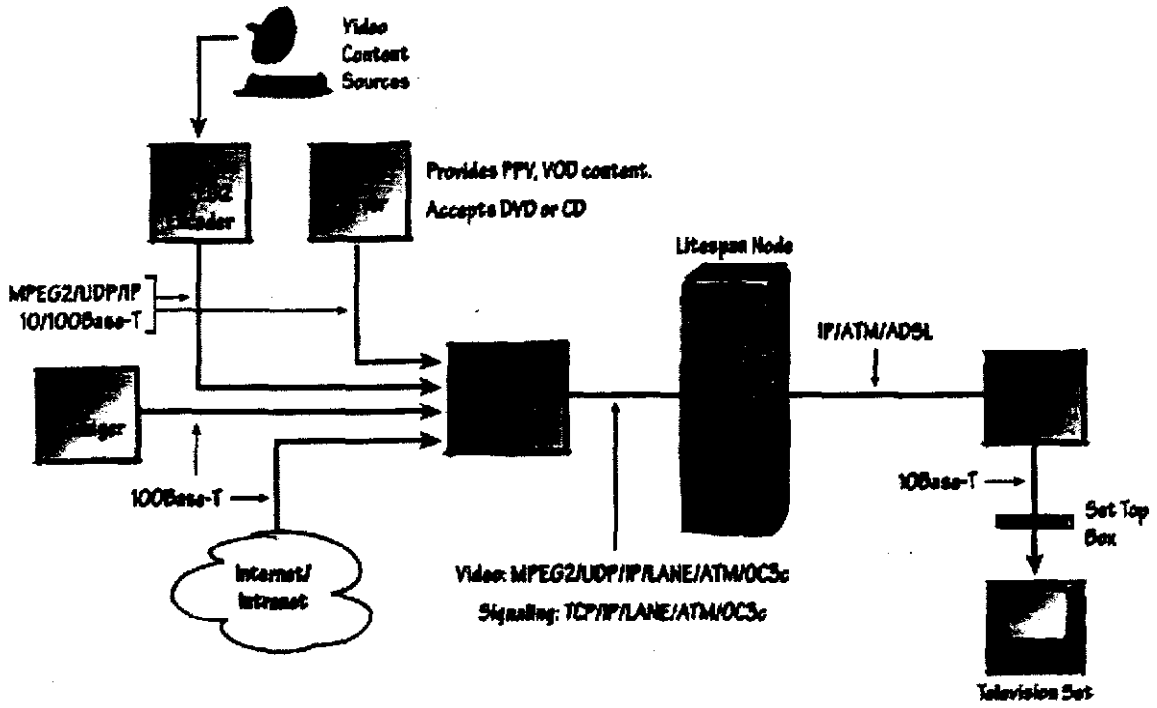

Figure 1. AAPP Broadband TV Solution

The central piece of the total broadband TV solution is delivery of the video contents over the broadband network. Broadcast TV over broadband requires the expertise of each solution partner in order to take advantage of the ADSL network. ADSL access technology uses existing twisted-pair copper plant to provide the bandwidth necessary to deliver IP-based, MPEG-format video streams without disrupting conventional telephone service to the customer premises. The bandwidth possibilities of ADSL allow service providers to dedicate the 3 Mb/s required for high-quality broadcast streams.

The broadcast video contents are converted by real-time digital encoders to the MPEG-2 format required for broadband transmission. They are then processed into IP multicast single-program transport streams (SPTS) to be delivered to the subscriber via the transport and access network.

The Litespan system can process and control high-speed digital video and conventional voice traffic, aggregating both to the service provider's broadband access network. Voice traffic is separated by a splitter at the subscriber's home. Digital video traffic is passed through the subscriber's ADSL modem and decoded. Once the digital video traffic is decoded, it passes to the set-top box connected to the subscriber's television.

Equipped with an ethernet interface that connects to the ADSL modem, the subscriber's set-top box decodes these MPEG video streams and sends them to the television. The set-top box gives subscribers a powerful interface to the broadband TV solution that includes all the features a consumer expects from digital TV subscription packages plus an Internet browser, menu bar, and virtual keyboard.

Provisioning and control of this video flow, from the original broadcast signal to broadband video viewed in a subscriber's living room, is provided by iMagicTV's DTV Manager. When the set-top box is turned on for the first time, it broadcasts a "BootP" request to initialize the subscriber's system. The DTV Manager recognizes this TCP/IP signaling request and downloads a client image, which includes the interactive program guide (IPG) to the set-top box.

Once the customer's broadband TV system is initialized and ready for use, all broadcast SPTS streams are sent to the multicast router. The broadcast channel selected by a subscriber is added to the multicast session on the multicast router so that a user can view the channel on the television. Channel selection or changing is handled through interaction of the set-top box and the multicast router without DTV Manager intervention.

The DTV Manager also provides the business and operations systems that manage subscriber profiles and channel packages, and that provide event collection for billing and program rating.

Video-on-Demand and Pay-Per-View Over ADSL

Subscribers to the broadband TV solution have access to a video-on-demand feature in addition to viewing broadcast channels. As previously stated, this broadband TV solution design allows many providers to leverage their current data network and copper plant investment. ADSL access networks also offer quality of service (QoS)

features. ADSL plus IP technology yields operation advantages for video-on-demand and pay-per-view services. Streamed video content from the nCUBE video server can be delivered over a managed network to guarantee high service quality. Innovation of service offerings and client devices is stimulated by the fact that the solution is based on standard Internet protocols.

When a subscriber selects a particular program title, the DTV Manager server acknowledges the request and informs the nCUBE MediaCUBE4 video server to start a particular video stream and deliver it to the subscriber's set-top box. IP routing to the user's set-top box is provided by the Litespan broadband access package. The MediaCUBE4 stores all video in the MPEG-2 format transported by the broadband access network.

The nCUBE video server operates the latest Oracle Video Server (OVS) software available. The hardware and software work in tandem to provide simultaneous access to a stream of video content for up to 44,000 users without impacting the quality of service delivery. Oracle software gives subscribers full VCR control of MediaCUBE4's video content. Subscribers are able to play, pause, fast-forward, and rewind at their leisure.

POWERFUL SOLUTION COMPONENTS

Litespan, the Alcatel Next-Generation Digital Loop Carrier

Alcatel has an in-depth knowledge of the issues that face today's network and service providers. Alcatel builds on that experience with its Litespan product, an evolving remote access platform that works with broadband ADSL products and services for an end-to-end broadcast TV solution. Alcatel's superior access platform serves more than 30 million subscribers in over 60 countries, providing an embedded base that offers high-speed ATM and xDSL services. Based on open industry standards, the Litespan system's support for the broadband TV solution enables operators to cost effectively enhance standard copper telephone lines for multimegabit video services. A Litespan node not only provides access via basic copper wire, but also simultaneously provides access via fiber-fed remote terminals (RT) and in fiber-to-the-curb/fiber-to-the-node (FTTC/FTTN) networks.

<u>High-Capacity, Modular System</u>

A point-to-point Litespan system can serve up to 2016 lines, providing low-cost residential telephone service plus broadband capabilities in the same plug-in channel slots. Once common control and optical interface plug-in modules are installed, the system can be increased in increments of 4 lines to up to 10,080 lines using GR-303.

Starspan®

The Starspan system is a FITL distribution system integrated into the Litespan SONET access system. Starspan offers a variety of ONU sizes from 48 to 96 lines. The integrated Starspan architecture of the Litespan common control can simultaneously support both copper- and fiber-fed services at each terminal.

Remote Software-Based Operations

With the Litespan system, all alarms, facility performance, hardware- and software-programmable channel unit settings, and features can be remotely accessed and provisioned for more efficient maintenance and operation. The OS interface may be accessed locally or remotely for "flow-through" service order provisioning.

Flexible SONET Networking

Litespan's SONET add/drop transport capability allows more flexible networks to be established in a carrier serving area environment. The Litespan system supports up to five remote terminal sites, allowing bandwidth to be distributed under software control to the remote sites. The SONET-based Litespan architecture also allows connections to be established from one remote site to another without having to involve the Litespan central office terminal.

iMagicTV DTV Manager

iMagicTV's Digital TV Manager is an innovative software solution designed specifically to help service providers leverage the ADSL advantage in the broadcast video delivery market. The iMagicTV DTV Manager, then, is a key component to the broadband TV solution. Standards-based and hardware independent, the DTV Manager uses open interfaces to work with the transport, access, and server components of multiple vendors while providing the same reliable, scalable, feature-rich server suite in a variety of network environments. DTV Manager servers can be combined in a single-server workstation and include these:

- Database server
- Multicast server
- Web server
- BootP/DHCP server
- Network File Services (NFS) server
- Remote Procedure Call (RPC) server
- Application server

In addition to the listed servers, the broadband TV solution uses the Oracle Video Server as a "data pump" for the video-on-demand service. The video server uses IP unicast to send video streams to set-top box IP addresses. Typically, a cookie passes authorization from the web server to the browser and then to the video server.

The DTV Manager client provides a range of user features that provide more choice, convenience and control for consumers. These features include the following:

- Interactive program guide (IPG) with seven days of program data
- Administration system that provides self-service features like parental control
- Portal capability that enables access to web content, video-on-demand, and e-commerce

Flexible Service Design and Management

Service providers can load DTV Manager software on a browser-enabled administration workstation, such as the Sun Solaris platform, and invoke Java-driven applications for an industry-standard, user-friendly interface. The DTV Manager's extensive service design features can configure channels and packages, design the look and feel of on-screen menus, and customize remote control functionality. iMagicTV also gives providers service management features to enable intelligent delivery, provisioning, and management of the broadband TV solution, including remote diagnostics of client devices, event tracking and collection, and reporting.

Maximum Availability and Scalability

To meet service provider's quality of service requirements, the DTV Manager supports highly available 7x24 operations. The iMagicTV solution is also highly scalable from hundreds to thousands to millions of set-top boxes. The key to DTV Manager's scalability is multicasting generic information, such as set-top boxes, IPG data, and boot information.

Powerful Subscriber Features

The iMagicTV DTV Manager also provides broadband TV subscribers with the interactive features they expect, as well as the following features for revolutionary multimedia entertainment:

- Interactive program guide
- Information banners
- Self-service main menu with channel blocking and password maintenance
- Integrated Internet access
- Closed captioning

Oracle Video Server Software

Oracle's technology has been a market leader since the inception of the digital quality video market. Today's Oracle Video Server reflects the product reliability and maturity gained from years of experience. Oracle Video Server 2 offers an enhanced feature set and unparalleled scalability backed by Oracle's comprehensive network of service and support personnel.

Leveraging the Oracle Advantage

Oracle Video Server software allows service providers to integrate their systems with Oracle8i and Oracle interMedia. Oracle8i enables powerful, high-performance management of digital video assets and serves as the foundation for back- and front-office applications such as billing, customer care, and trafficking.

Oracle interMedia extends the Oracle8i reliability and availability to Internet-based applications that need to access image, audio, video, location, text, and relational data. This integration delivers browser-based video and audio. It provides a robust platform for developing enterprise-wide content management and web-site data stores.

Best Quality Multimedia Experience

The Oracle Video Server gives Broadband TV subscribers professional, broadcast-quality video and audio and real-time feeds with full VCR control over stored content and live broadcasts.

Intuitive Graphical Interface

On-line monitoring of clients; content and logical clip creation; scheduled playback; and log-file browsing are just a few of the features available with Oracle's new Video Server Manager. This is an intuitive, Java-based user interface, allowing system administrators to simply point and click to locate information about equipment status and the availability of video assets, and to troubleshoot system problems.

Patented Visual Scan

The Oracle Video Server allows users to fast-forward and rewind programs at multiple speeds without having to store content multiple times on the server.

Network Provisioning Support

In a complex broadband TV solution configuration, the video server can assign playback requests to network interfaces appropriate for the client, and it can allocate or set up network resources to handle the traffic.

nCUBE MediaCUBE4 Video Server Hardware

Founded in 1983, nCube is the world's leading supplier of interactive multimedia servers. nCUBE has performed over 100 video-on-demand installations, delivering more than 17,000 streams featuring full VCR functionality for the subscriber. nCUBE brings this expertise to its MediaCUBE4 Video Server hardware and the broadband TV solution.

With MediaCUBE4, nCUBE has expanded the scalability and high availability that have always distinguished its products, while reducing the server's price and footprint considerably. nCUBE also provides a video-on-demand management application to manage all of the data flows needed to provision, deliver, monitor, and bill for the service. Using Oracle's Video Server software, the nCUBE portion of the broadband TV solution is compatible with multiple network environments.

Compact Power and Granular Scalability

The building block of the MediaCUBE4 server is the MediaHUB, a compact computer containing all the components it needs to operate as an independent video server; these include hard disk drives, output modules, and a CPU. A single MediaHUB can deliver 172 simultaneous 3-Mb/s streams. Using nCUBE's hypercube interconnection architecture up to 256 MediaHUBS can be connected to function as a single computer, providing unmatched scalability and flexibility for the broadband TV solution. The nCUBE MediaCUBE4 is the only platform that is capable of 44,000 simultaneous streams.

Cost-Effective Design

By delivering so many streams from a single server and avoiding the need to replicate content, nCUBE can match the prices of PC-based approaches for small-scale servers; it offers the only cost-effective solution for larger systems. This broadband TV solution video server also requires less rack space and fewer disk drives, cables, fans, and power supplies, resulting in lower operating costs.

High Availability

Fewer system components also lower the number of potential points for failure in the system, resulting in improved reliability. Also, nCUBE's patented MediaCUBE architecture enables the server to continue streaming video should a disk drive, output module or entire MediaHUB computer fail. If that happens, the component can be replaced while the rest of the broadband television video server remains fully operational. Unlike other architectures, the MediaCUBE's streaming capacity is not impacted when a drive failure requires redundant arrays of inexpensive disks (RAID) reconstruction of video data.

Large Content Library

To support the video-on-demand service available with the broadband TV solution, the nCUBE MediaCUBE expands beyond hit movies to include time shifted programming, educational programming and other services that require content libraries exceeding 1000 titles. nCUBE is the only platform that can provide such a library without needing content duplication.

No Content Replication

The MediaCUBE architecture guarantees that up to 44,000 broadband TV solution users can access, with VCR control, the same content (at 3 Mb/s) at the same time without the need to create duplicate copies of the file. Or these same 44,000 users may simultaneously access different content. This enables broadband TV providers to expand their content libraries using far fewer disk drives than less scalable platforms.

CONCLUSION

Competing in the marketplace means leveraging the installed network to create the new, revenue-generating multimedia services demanded by today's telecommunications consumer. Alcatel Access Partnering Program's broadband television solution gives service providers such an opportunity to expand services on their twisted-pair copper cable networks.

When implementing new services, providers must be sure their networks have best-in-class elements and design. The broadband TV solution offers providers the assurance of an end-to-end, strategically integrated solution with the best components in the industry. The extensive experience and sophisticated network technologies of Alcatel, Oracle, nCUBE, and iMagicTV come together for a dynamic, fully interoperable system with maximum growth potential. At the same time, service providers can create a tailored solution, defining their service features and pricing for a unique brand.

Scalable, cost-effective, and standards-based, AAPP's broadband TV solution gives providers everything they need to cultivate their business for the future.